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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/589,348	08/11/2006	Eiichi Shimizu	1592-0164PUS1	8171

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EXAMINER	
KACKAR, RAM N	

ART UNIT	PAPER NUMBER
1792	

NOTIFICATION DATE	DELIVERY MODE
04/06/2009	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

mailroom@bskb.com

Office Action Summary	Application No.	Applicant(s)	
	10/589,348	SHIMIZU ET AL.	
	Examiner	Art Unit	
	Ram N. Kackar	1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *30 January 2009*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1 and 3-7* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1 and 3-7* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 1/30/2009 has been entered.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1 and 3-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicants admitted prior art (AAPA) in view of Gurary et al (US 6001183).

AAPA disclose all limitations of these claims except a recess portion depressed in a dome shape at a back side of the wafer containing member so that an apex of the dome shape is arranged on a straight line connecting a center of the wafer containing member with a center of the heating uniformizing member.

Gurary et al teach a deposition apparatus with,

Heating assembly (20), wafer containing member 24 and a susceptor (uniformizing member 14 and gas for deposition (Fig 1 and Col 1 line 43 to Col 2 line 9).

Gurary et al teach different shapes of the gap below the wafer holder for improved uniformity of temperature (See Fig 14, Fig 15 and 16) including dome shaped gap (See Col 13 line 20 to Col 15 line 42).

Gurary et al teach that by optimizing the gap and the thickness of material at wafer holding member and or susceptor thermal conductivity is controlled to compensate for non uniformity caused at different regions by non uniform heat transfer (Abstract).

AAPA as well as Gurary teach wafer holder and heat uniformizing member to be made of graphite or molybdenum which have good thermal conductivity of the claimed range.

Regarding the particular shape of the gap, it is noted that the gap compensates for natural tendency of the surface temperature of the substrate to be non-uniform. This means that size shape and location of the gap would be such as to compensate for the non-uniformity.

It is therefor obvious that one of ordinary skill in the art would find a dome shaped gap appropriate for temperature uniformity at the surface of the substrate.

Regarding H/D ratio, it appears to be in the claimed range according to dimensions disclosed in different embodiments. Further, the dimensions could be optimized to compensate for non uniform loss of heat from the wafer through supporting structure.

Regarding claims 5-7, these recitations are directed to a result of thermal process and would be obvious when the gap is optimized to reduce temperature uniformity.

4. Claims 1 and 3-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicants admitted prior art (AAPA) in view of Yoshiyuki Kamata et al (JP 06124901) as evidenced by Eiichi Shimizu (WO 2003/107403 or English equivalent US 7344597).

AAPA disclose all limitations of these claims except a recess portion depressed in a dome shape at a back side of the wafer containing member so that an apex of the dome shape is arranged on a straight line connecting a center of the wafer containing member with a center of the heating uniformizing member.

AAPA teaches that wafer holder and heat uniformizing member are made of graphite or molybdenum which have good thermal conductivity of the claimed range.

Yoshiyuki et al teach a MOCVD apparatus which heats a semi-conductor substrate by the induction-heating method with a quartz spacer (wafer containing member 10) fixed between the susceptor and the semi-conductor substrate and having a dome-shaped recess (Fig.10 - 10b). Yoshiyuki et al teach that the configuration of this spacer is correlated to the temperature distribution of the substrate. Therefore the ratio of height and diameter of the recess would be an optimizable feature. The temperature profile at the substrate gets modified by varying thermal conductance between the susceptor (uniformizing member 11).

This is consistent with the teaching of Eiichi Shimizu (Abstract). Eiichi Shimizu teach that the resistance of the thermal path determines the temperature at the surface of the substrates.

In Yoshiyuki et al, by having a dome shaped gap at the center, relative thermal resistance between the center and periphery is changed. This however is according to laws of heat transfer as explained by Eiichi Shimizu. It is noted that the gap changes the relative thermal transfer between the center and periphery. The total heat transfer will of course depend upon the thermal conductivity of the materials. AAPA discloses materials of high thermal conductivity to allow higher temperature at the surface faster.

Yoshiyuki et al teach the height of wafer containing member to be 2.6-3 mm. It can be seen from this that the H/D ratio falls within claimed range.

Thus, it would have been obvious to one of ordinary skill in the art at the time applicant's claimed invention was made to have provided the ratio of the height and the diameter H/D is between 0.01 and 2.10% and the ratio of the height and the diameter H/D is between 0.50 and 1.50% in order to form a thin film on the surface of a semi\- conductor substrate and achieve uniform surface temperature as taught by Yoshiyuki et al.

Regarding claims 5-7, these recitations are directed to a result of thermal process and would be obvious when the gap is optimized to reduce temperature uniformity

5. Claims 1 and 3-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicants admitted prior art (AAPA) in view of Bader et al (US 20040187790).

AAPA disclose all limitations of these claims except a recess portion depressed in a dome shape at a back side of the wafer containing member so that an apex of the dome shape is arranged on a straight line connecting a center of the wafer containing member with a center of the heating uniformizing member.

Bader et al teach a deposition apparatus with,

Heating assembly, wafer containing member and a susceptor with varying configuration of space as in Fig 6A, 6C, 8A and 8B for the purpose of uniform temperature distribution by compensating spatial thermal transfer utilizing varying thickness of recess including dome like structure as in Fig 8B.

Regarding H/D ratio, it appears to be in the claimed range according to dimensions disclosed in different embodiments. Further, the dimensions could be optimized to compensate for non uniform loss of heat from the wafer through supporting structure.

Regarding claims 5-7, these recitations are directed to a result of thermal process and would be obvious when the gap is optimized to reduce temperature uniformity

Response to Arguments

Applicant's arguments filed 1/30/2009 have been fully considered but they are moot in view of the present grounds of rejection.

Applicant argues that:

Gurary teaches a wafer carrier/susceptor combination for use in an epitaxial deposition process. However, Gurary does not teach or suggest a "recess portion depressed in a dome shape", as presently claimed. Figures 14 and 13 of Gurary teach spherical curved profiles formed in the apparatus of (see also column 13, lines 20-62). However, these spherical curved profiles do not fall within the definition of a "dome". Moreover, Gurary fails to teach an apparatus comprising a wafer containing member comprising a material having a heat conductivity of from 50W/mK to 500W/mK, a recess portion height (H) of 0.02mm to 3.55mm, or an H/D ratio of 0.01 to 2.10%.

In response it is noted that particular shape depends upon spatial thermal conductivity required to compensate for non-uniformity at the surface of the substrate. It would be obvious to optimize shape, size and location of the gap according to non-uniformity observed at the surface of the substrates without this gap, in order to compensate for it.

Applicant argues that:

In Yoshiyuki, quartz is used as a spacer. Heat conductivity of a quartz glass is about 2 W/mK, whereas heat conductivity of a crystal is less than 10 W/mk Thus, the heat conductivity of quartz is much smaller than that of the material used for the wafer containing member of the present invention. As a result, the heat uniformity achieved in the present invention cannot be attained with the apparatus of Yoshiyuki. Based on FIG. 1 of Yoshiyuki, the temperature variation of the substrate surface is thus about 5°C, which causes a much greater temperature deviation on the spacer surface which the wafer contacts.

In response it is noted that particular shape depends upon spatial thermal conductivity required to compensate for non-uniformity at the surface of the substrate. It would be obvious to optimize shape, size and location of the gap according to non-uniformity observed at the surface of the substrates without this gap, in order to compensate for it. Further, it would be obvious to keep the materials of the AAPA same for higher thermal conductivity and use the gap structure of Yoshiyuki for improving upon non-uniformity.

Applicant's arguments against the reference of Bader et al are similarly unpersuasive.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ram N. Kackar whose telephone number is 571 272 1436. The examiner can normally be reached on M-F 8:00 A.M to 5:P.M.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on 571 272 1435. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Ram N Kackar/
Primary Examiner, Art Unit 1792